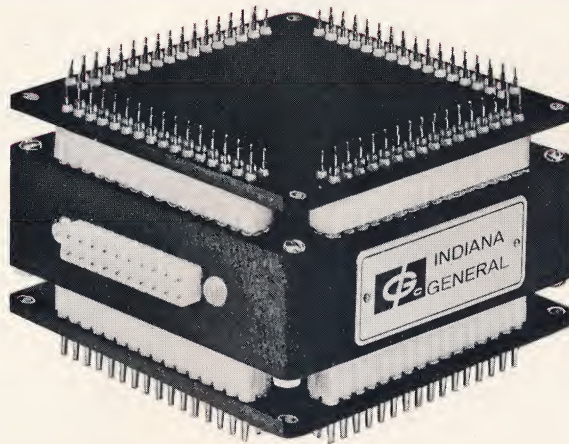
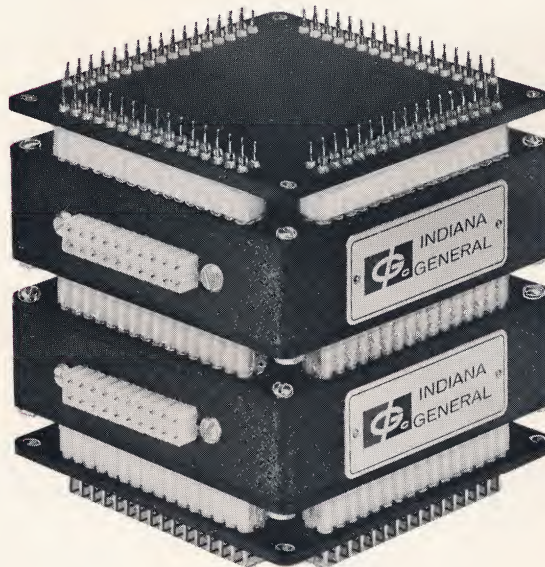


RUGGEDIZED MICROSTACK[®]



64 x 64 x 10 + 10 MINUTES



= 64 x 64 x 20!

INDIANA GENERAL 

ELECTRONICS DIVISION / MEMORY PRODUCTS

INDIANA GENERAL RUGGEDIZED

Rugged Design Meets Stringent MIL-SPECS

As computer applications become more widespread, there is an increasing demand for memories that will operate reliably in extreme temperature, humidity, altitude, vibration, shock and corrosive environments. In addition, a growing number of memory system applications require rugged construction combined with expandable storage capacity and simplified servicing.

To meet these requirements, Indiana General developed the Ruggedized Microstack — a tough, compact, new memory stack with built-in connectors allowing instant expansion of memory system bit length.

Indiana General's Ruggedized Microstack will meet extreme environmental tests in compliance with the following MIL-SPECS:

VIBRATION — MIL-E-5272C, procedure XII

HUMIDITY — MIL-T-5422E, para. 4.4

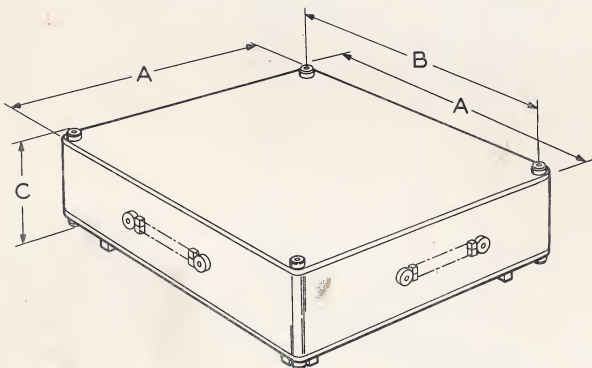
ALTITUDE — MIL-E-5272C, cond. C

SHOCK — MIL-E-5272C, procedure V, using MIL-S-4456 (sand drop) and MIL-E-5272C, procedure V, using MIL-S-901 (hammer)

Integral Connectors Allow Instant Expansion

A complete memory for a particular application is composed of one or more modules, each with a standard length of ten bits. Modules are standardized in the following arrays: 16x16, 32x32, and 64x64 (variations can be furnished if required). All leads of each individual module are terminated with connectors mounted directly onto the enclosure. The X and Y drive lines start and finish on opposite ends of the module; one end at a male connector, the other at a female connector. Sense and inhibit connectors are located on the sides. This unique design permits modules to be plugged together "piggyback" to form a stack of any bit length. A memory stack can be expanded in a matter of minutes simply by adding a sense and inhibit connector to the memory system. For example, two 64x64x10 stack modules (plus 10 minutes) will yield a 64x64x20 memory stack.

The connectors used in the new stack are designed for wire wrap; however, internal connections are soldered due to the small wire gauges necessary in core matrices. Mating connectors for external circuitry can be offered suitable for wire-wrap or with shortened posts suitable only for soldering. These connectors can be shipped in advance for pre-wiring into the system so that the unit will be ready to accept the stack when it is delivered.



Method of Stringing Memory Array

IGC's modular, Ruggedized Microstack utilizes the folded array technique of stringing cores. This unique method was pioneered by IGC and has been time-proved in many critical applications.

In the folded array technique, mats of cores are strung on continuous wires, and then folded one upon the other to form the complete array for a stack module. Conventional frames for supporting individual mats of cores are eliminated, resulting in a compact design.

The folded array technique also results in increased reliability because 80% fewer solder connections are required, compared to conventional discrete plane construction.

MAXIMUM ARRAY

DIMENSIONS

	A	B	C
.020 and .030 Cores			
16x16x10	1.734	1.296	1 $\frac{1}{16}$
32x32x10	2.218	1.781	1 $\frac{1}{16}$
64x64x10	3.187	2.750	1 $\frac{1}{16}$
.050 Cores			
16x16x10	2.343	1.906	1 $\frac{7}{32}$
32x32x10	3.156	2.718	1 $\frac{7}{32}$
64x64x10	4.750	4.312	1 $\frac{7}{32}$
.080 Cores			
16x16x10	2.828	2.390	2 $\frac{1}{32}$
32x32x10	4.109	3.671	2 $\frac{1}{32}$
64x64x10	6.671	6.234	2 $\frac{1}{32}$

MICROSTACK[®]

Wide-Temperature Cores Eliminate Compensation Circuitry

A Ruggedized Microstack strung with IGC's wide-temperature ferrite cores can operate over any 100°C range within -50°C to +125°C with $\pm 5\%$ drive current tolerances — while providing high output signals with excellent signal-to-noise discrimination. Figure 1 illustrates typical oscillographs of a demonstrator plane showing core responses with one half of the plane operating in oil at 5°C, while the other half operates simultaneously in oil at 80°C. Figure 2 gives typical data for a 64x64 plane with a double check-board pattern. Figure 3 shows oscillograph responses for a 64x64x10 Microstack operating at temperatures between -40°C and +100°C.

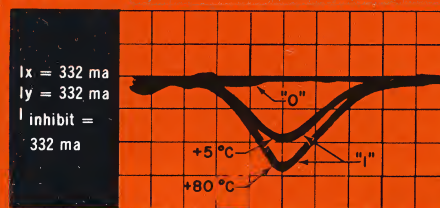
Conventional cores can normally withstand $\pm 5\%$ drive current variations over a minimum 30°C operating temperature range centered at, or below 25°C. In certain cases, a 50°C operating range may be possible.

In cases where wide ambient temperature operation is required, and where the system can accommodate increased drive current for a given switching speed, IGC's wide-temperature cores are your answer.

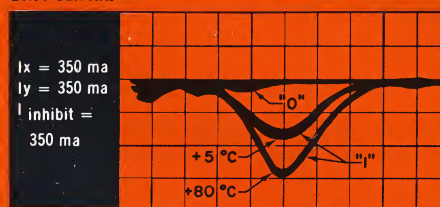
The compact nature of IGC's modular connector-type stack does provide a measure of internal heating due to copper losses. The most extreme case would occur when writing all zeros, where all inhibit windings are operated simultaneously. The amount of heat in this case — considering a 200 ma inhibit current, with a duty cycle of 25% — would be approximately 15°C. Stacks with wide-temperature cores would not be particularly sensitive to this temperature change.

Full cycle operating speeds of the Ruggedized stack cover the same range as conventional stacks — from less than one microsecond through ten microseconds.

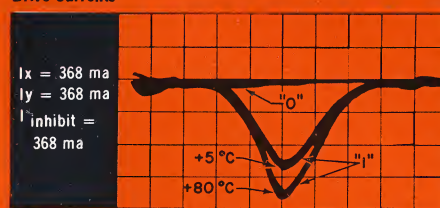
Drive Currents



Drive Currents



Drive Currents



SCALE: 26 mv/Div
0.2 μ s/Div

FIG. 1 — OSCILLOGRAPHS OF DEMONSTRATOR PLANE.

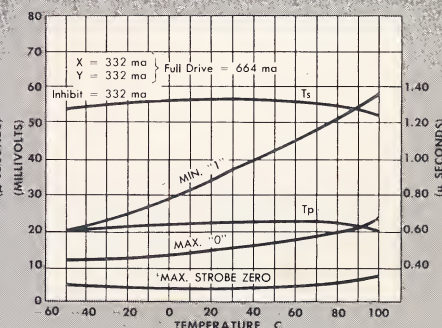
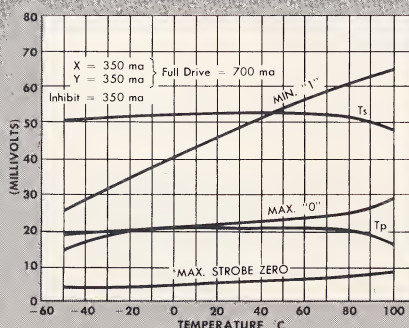
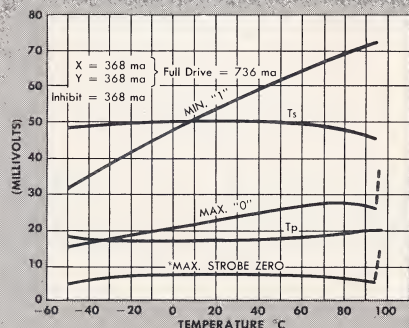


FIG. 2 — TYPICAL DATA FOR 64x64 PLANE

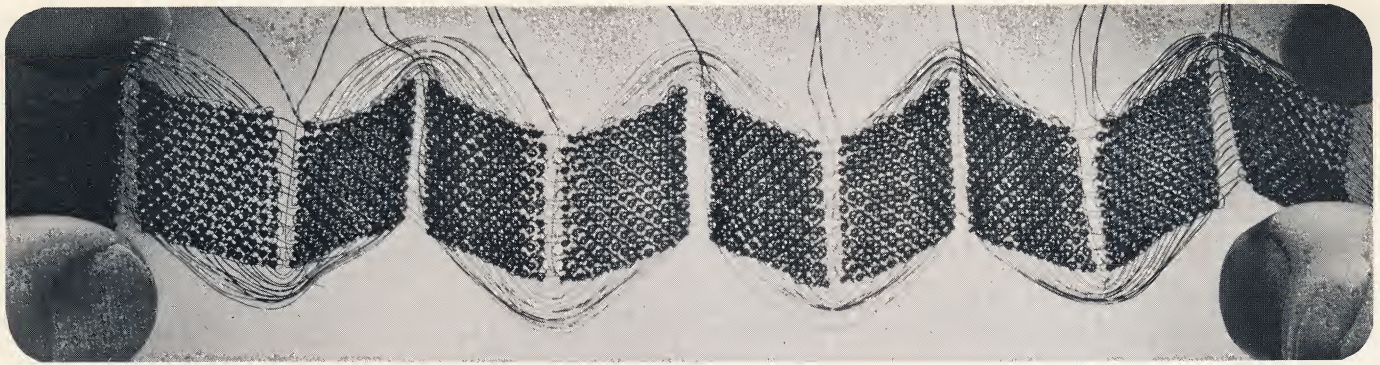
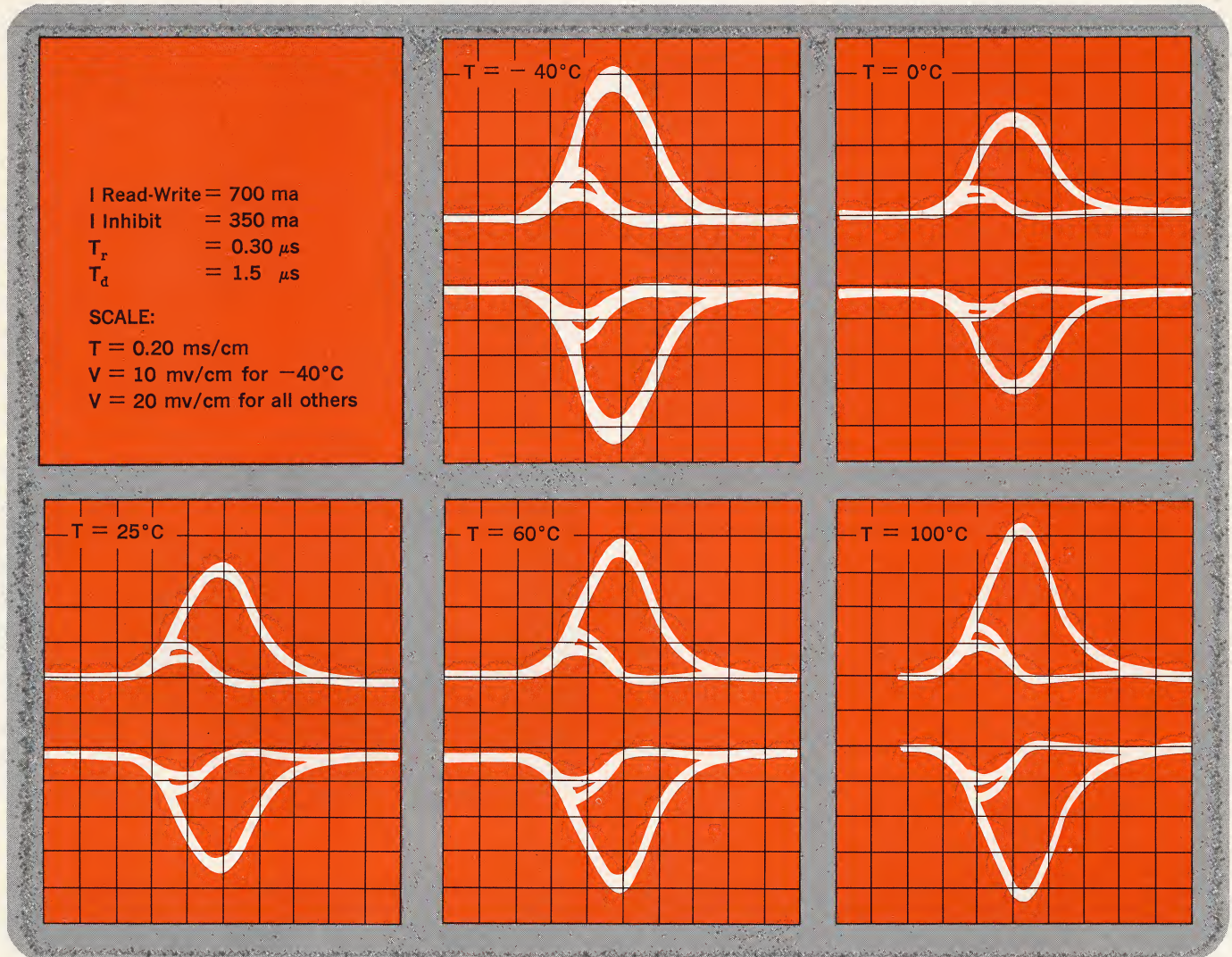


FIGURE 3 — 64x64x10 RUGGEDIZED MICROSTACK, DOUBLE CHECKERBOARD PATTERN



For additional information on Ruggedized Microstacks, memory cores or complete memory systems, phone or write Indiana General Corporation, Electronics Division/Memory Products, Keasbey, New Jersey.

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